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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/007,412	12/05/2001	Jeffrey D. Morse	IL-10634	4077
7590 06/15/2004				
Laboratory Counsel P.O. Box 808, L-703 Livermore, CA 94551				
EXAMINER KERN, KEVIN P				
ART UNIT 1725 PAPER NUMBER				

DATE MAILED: 06/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/007,412		MORSE ET AL.	
	Examiner		Art Unit	
	Kevin P. Kerns		1725	

- The MAILING DATE of this communication appears on the cover sheet with the correspondence address -

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 December 2001 and 06 February 2004.
- 2a) ☐ This action is FINAL.
- 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 and 32-41 is/are pending in the application.
- 4a) Of the above claim(s) 29,30 and 32-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☒ Claim(s) 5 and 18 is/are objected to.
- 8) ☒ Claim(s) 1-30 and 32-41 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>12/5/01, 1/14/04, + 2/13/04</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-28, drawn to microreactors, classified in class 422, subclass 211.
 - II. Claims 29, 30, and 32-34, drawn to a method for forming a microreactor, classified in class 48, subclass 61+.
 - III. Claims 35-41, drawn to methods of operating a microreactor, classified in class 48, subclass 197R.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the method of Invention II can be used to form a product materially different from that of Invention I. For example, the method of Invention II can form a product having a capillary microchannel interfaced with a porous membrane at the outlet of the microchannel.

3. Inventions I and III are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially

different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the products of Invention I can be used in a process materially different from that of Invention III. For example, the microreactors of Invention I can be heated to different temperatures than the temperature range set forth in the processes of Invention III.

4. Inventions II and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions are processes of forming a microreactor (structural formation) and operating a microreactor (to produce hydrogen).

5. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

6. Because these inventions (Inventions II and III) are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

7. During a telephone conversation with Ann Lee on June 3, 2004, a provisional election was made with traverse to prosecute Invention I, claims 1-28. Affirmation of

this election must be made by applicant in replying to this Office action. Claims 29, 30, and 32-41 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

8. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

9. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the catalyst material (claims 1, 3, 7, 8, 17, 22-24, and 27), a manifold of a fuel cell (claims 6 and 26), a liquid chemical reservoir (claim 9), and means for processing more than one type of liquid fuel component into hydrogen fuel (claim 21) must be shown or the feature(s) cancelled from the claim(s). No new matter should be entered.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be cancelled, the

appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

10. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

11. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction

of the following is required: the claimed fuel flow rate range (claim 18) is absent from the specification.

12. The disclosure is objected to because of the following informalities: on page 3, last line, "microcumbuster" should be changed to "microcombustor". On page 6, 2nd line from the end of paragraph [0017], the updated status of patent application 09/241,159 is now US Patent No. 6,638,654. Appropriate correction is required.

Claim Objections

13. Claims 5 and 18 are objected to because of the following informalities: in claim 5, 2nd line, "microcumbustion" should be changed to "microcombustion". In claim 18, 3rd line, "microleters" should be changed to "microliters". Appropriate correction is required.

Claim Rejections - 35 USC § 112

14. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

15. Claims 10, 18, and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 recites the limitations "said capillary microchannel" and "the flow".

There is insufficient antecedent basis for these limitations in the claim.

Claim 18 recites the limitation "the capillary microchannels". There is insufficient antecedent basis for this limitation in the claim.

Claim 25 recites the limitation "the flow". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

16. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

17. Claims 1-4, 7-9, 11-16, 19, 21-24, 27, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Chatterjee et al. (US 5,961,930).

Chatterjee et al. disclose an integrated micro-ceramic chemical plant with insertable reaction chambers and micro-filters, in which the microreactor includes multiple ceramic layers (ceramic substrate layers 20,30,100); a plurality of capillary microchannels contained between the substrate layers and having respective inlet conduits 12 and outlet conduits 62; a plurality of catalyst materials packed between the inlets and outlets and imbedded in a microporous membrane 72 (getter); an integrated

resistance heating element 40 along the lengths of the microchannels and adjacent the microporous membrane 72; and a chemical delivery chamber 34 (from liquid chemical reservoir) and chemical mixing chamber 35 (means for processing more than one type of liquid fuel into hydrogen fuel), such that reaction products are delivered through outlet tubes 62 via discharge channels 61 (abstract; column 2, lines 31-67; column 3, lines 1-7; column 5, line 9 through column 8, line 32; column 11, line 47 through column 13, line 50; and Figures 1-6).

18. Claims 1, 7, 13, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by DE 198 41 993.

DE 198 41 993 discloses a microstructure reactor that includes microchannel structures 2 having inlets and outlets within a silicon substrate 3 and a catalyst 1 packed between the inlets and outlets, such that the microstructure reactor is heated with integrated resistance heaters (abstract; and Figure).

19. Claims 1-16, 19, and 21-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Koripella et al. (US 6,569,553).

Koripella et al. disclose a fuel processor (microreactor) with an integrated fuel cell, such that the microreactor fuel processor 10 includes a multilayer ceramic structure 12 (substrate) having a plurality of multi-directional flow microchannels with a fuel inlet 20 (combination fuel comprised of methanol and water from respective reservoirs 24,26) and a hydrogen enriched fuel outlet 22 for supplying fuel cell stack manifold 32; an

integrated heater 28 along the length of the microchannels (either resistance or a microcombustion, or chemical, heater -- see claims 2-5 of reference) within the reaction zone 18 that includes a plurality of packed catalyst materials such as copper oxide and zinc oxide; and a multiplicity of parallel channels 61 with an inert porous ceramic material for thermal control, in communication with a porous diffuser 113 (membrane), or getter (abstract; column 2, lines 1-33 and 66-67; column 3, line 1 through column 6, line 12; claims; and Figures 1-8).

Claim Rejections - 35 USC § 103

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

21. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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22. Claims 17, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Chatterjee et al. (US 5,961,930) or Koripella et al. (US 6,569,553).

Chatterjee et al. and Koripella et al. individually disclose the elements of claims 1, 2, and 19 above. Neither Chatterjee et al. nor Koripella et al. specifically discloses the ranges of the fuel flow rates, as well as the surface areas of the catalysts and porous structures.

However, one of ordinary skill in the art would have recognized that the ranges of fuel flow rates to supply fuel cells would necessarily be determined and optimized for appropriate functioning of the fuel cell, as a minimum amount of fuel flow is proportional to a minimum fuel consumption needed for the fuel cell to adequately operate. Furthermore, the surface areas of the catalysts and porous structures would also need to be optimized by one of ordinary skill in the art to achieve adequate production of fuel flow from the chemical reaction, and would be inadequate if the surface areas were too low (lacking catalytic reaction sites). As a result, it would have been obvious to one of ordinary skill in the art at the time the applicants' invention was made to optimize the fuel flow rates and surface areas of the catalysts and porous structures, in order for the fuel production efficiency to be increased in supplying the fuel cell.

Conclusion

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The Ashmead et al., Ghosh et al., Lippert et al., Schwalbe et al., and Jankowski et al. references are also cited as related art.

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kevin P. Kerns whose telephone number is (571) 272-1178. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (571) 272-1171. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin P. Kerns *Kevin Kerns 6/9/04*
Examiner
Art Unit 1725

KPK
kpk
June 9, 2004